`DETAILED ACTION

1. The cancellation of original claims 1-10 and the addition of new claims 11-20 in the preliminary amendment dated 18 January 2006 are acknowledged. Claims 11-20 are therefore pending in this application.

Priority

2. This application claims priority as a national stage application under the Patent Cooperation Treaty, with effective filing date 16 July 2004, and claims foreign priority of application FR 03 08822, filed in France on 18 July 2003.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: “Method for acquiring a fingerprint image by stitching multiple partial images together, with image capture rate dependent upon finger movement rate”.

4. The disclosure is objected to because of the following informalities: Section headings are missing throughout the specification. Appropriate correction is required.

The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant’s use.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

(a) TITLE OF THE INVENTION.
(b) CROSS-REFERENCE TO RELATED APPLICATIONS.
(c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
(d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT.
(e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC.
(f) BACKGROUND OF THE INVENTION.
(1) Field of the Invention.
(2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
(g) BRIEF SUMMARY OF THE INVENTION.
(h) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
(i) DETAILED DESCRIPTION OF THE INVENTION.
(j) CLAIM OR CLAIMS (commencing on a separate sheet).
(k) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
(l) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

Claim Objections

5. Claim 11 is objected to because of the following informality: The list of steps in claim 11 lacks a conjunction ("and" or "or") before the last item in the list. Appropriate correction is required. For the purposes of examination against the prior art, Examiner assumes that the word "and" appears in the aforementioned location.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 11-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mainguet, U.S. Patent 6,289,114 (issued 11 September 2001, hereinafter Mainguet), in view of Pollard, U.S. Patent 6,005,681 (issued 21 December 1999, hereinafter Pollard) and Douskey et al., U.S. Patent Application Publication (published 29 May 2003, hereinafter Douskey).

8. With respect to claim 11, Mainguet discloses the acquisition via processor (Fig. 4 #60) of overlapping partial images (Fig. 5), searching for the displacement between two of the acquired images in terms of image pixels (col. 8 lines 11-23, "These operations consist in successively trying out all the possible cases of overlapping between the images… and in assigning a correlation coefficient to each trial. The best correlation coefficient will inform the system of the optimum position of overlapping….", inherently in terms of pixel units and in horizontal and vertical directions separately due to the arrangement of the imaging device). Mainguet does not specifically disclose comparing the displacement in one direction to a threshold and then using that comparison to adjust the sampling rate of the sensor.

However, Pollard discloses a method wherein the sampling rate of a sensor is altered such that the displacement between frames remains within certain bounds (col.

14 lines 59-64), and Douskey discloses keeping an error value within certain bounds by applying an incremental or decremental change to a sampling rate (paragraph 99).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the method of fingerprint acquisition of Mainguet with the method of maintaining displacement of two successive frames between particular bounds as disclosed by Pollard and the method of incrementing or decrementing a sampling rate to keep a related value within particular bounds as disclosed by Douskey, motivated by the improvements in processing time, when the successive images are subsequently stitched together to form a full fingerprint image, that arise from keeping the displacement in one direction nominally constant (Mainguet, col. 9, lines 1-10).

9. With respect to claim 12, Mainguet further discloses finding the best correlation value of displacements between partial images (col. 8 lines 15-19) and using that displacement to shift and superimpose the partial images in order to reconstruct the full image (col. 8 lines 19-23).

10. With respect to claim 13, Mainguet does not specifically disclose adjusting the sampling rate of the sensor.

However, Pollard discloses adjusting the sampling rate such that the optimum displacement between successive images stays nominally constant (col. 14 lines 59-64).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the fingerprint acquisition method of Mainguet, Pollard, and Douskey with the method of maintaining displacement of two successive frames at a nominally constant level as disclosed by Pollard, motivated by the improvements in processing time, when the successive images are subsequently stitched together to form a full fingerprint image, that arise from keeping the displacement in one direction nominally constant (Mainguet, col. 9, lines 1-10).

11. With respect to claim 14, Mainguet does not specifically disclose adjusting the sampling rate of the sensor.

However, Douskey discloses incrementing the sampling rate by an incremental value when an error level passes below a lower bound and decrementing the rate when the error level passes above an upper bound (paragraph 99).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the fingerprint acquisition method of Mainguet, Pollard, and Douskey with the method of incrementing or decrementing a sampling rate to keep a related value within particular bounds as disclosed by Douskey, motivated by the improvements in processing time, when the successive images are subsequently stitched together to form a full fingerprint image, that arise from keeping the displacement in one direction nominally constant (Mainguet, col. 9, lines 1-10).

12. With respect to claim 15, Mainguet further discloses that the optimal overlap between two successive images is five or six rows (i.e., differing by one pixel, col. 5, lines 33-37). The displacement between two successive images is directly related to the overlap of two images, as the sum of the two values will always equal the width of the image captured by the sensor. Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to set the lower and upper thresholds disclosed by Douskey above such that they also differ by one pixel.

13. With respect to claim 16, Mainguet again further discloses that the optimal overlap between two successive images is five or six rows (col. 5, lines 33-37). The displacement between two successive images is directly related to the overlap of two images, as the sum of the two values will always equal the width of the image captured by the sensor. One of ordinary skill in the art would therefore set the thresholds for displacement such that the overlap between two successive images tends to stay between five or six rows. For a sensor with a total width of eight rows as disclosed in the present application, the thresholds would be two and three pixels.

14. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mainguet, Pollard, and Douskey as applied to claim 11 above, and further in view of Machida, U.S. Patent Application 10/338,268 (filed 7 January 2003 and published 8 July 2004).

15. With respect to claim 17, Mainguet does not disclose limiting the correlation calculation to the image captured by only a portion of the sensor.

However, Machida discloses a sensor (Fig. 2) where finger motion is specifically tracked only by a portion of the sensor (paragraph 25, Fig. 2 #116B).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the method of Mainguet, Pollard, and Douskey with the sensor and method of tracking finger movement with only a portion of the sensor as disclosed by Machida, because doing so allows the sensor to have fewer elements, reducing its cost (Mainguet, col. 5 lines 19-21) without sacrificing accuracy in terms of tracking finger motion (Mainguet, col. 5 lines 39-42).

16. With respect to claim 18, Mainguet does not disclose limiting the correlation calculation to the image captured by only a portion of the sensor.

However, Machida discloses a sensor (Fig. 2) where a central region has more rows than in the distal regions, and where the central region is used to track finger motion (paragraph 25, Fig. 2 #116B,A).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the method of Mainguet, Pollard, and Douskey with the sensor and method of tracking finger movement with only a portion of the sensor as disclosed by Machida, because doing so allows the sensor to have fewer elements, reducing its cost (Mainguet, col. 5 lines 19-21) without sacrificing accuracy in terms of tracking finger motion (Mainguet, col. 5 lines 39-42).

17. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mainguet, Pollard, and Douskey as applied to claim 11 above, and further in view of Rhoads, U.S. Patent Application Publication 2002/0186886 A1 (published 12 December 2002, hereinafter Rhoads).

18. With respect to claim 19, Mainguet discloses stitching together images based on correlations determined from integer spacings of pixels, but does not disclose interpolating the partial images to calculate correlations based on non-integer spacings.

However, Rhoads discloses a method of registering two images with high accuracy based on interpolating the images and matching them to sub-pixel accuracy ("This is a fairly standard image processing methodology. Typically this would be done using generally smooth interpolation techniques and done to sub-pixel accuracy," paragraph 108).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the partial fingerprint image stitching method of Mainguet, Pollard, and Douskey with the interpolation before registration as disclosed by Rhoads, motivated by the ability to get a higher (sub-pixel) accuracy when stitching together the images in question (Rhoads, paragraph 108).

19. With respect to claim 20, Mainguet further discloses reconstructing a global image based upon the aggregate displacement of successive images relative to a first image (inherent in, "A resultant image… of the two [first and second] images... is kept in

the random-access memory...," and "The next [third] image is, in turn, compared to the resultant image [of the first and second images combined] in the same way as here above enabling the obtaining of an image... resulting from the superimposition of [the first, second, and third images] in their optimum overlapping position. The process is repeated in the same way until the complete image of the fingerprint… is obtained," col. 8 lines 52-67).

Conclusion

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Barry Drennan whose telephone number is 571-270-7262. The examiner can normally be reached on Monday through Thursday and alternate Fridays from 8:30am to 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Abul Azad can be reached on 571-272-7599. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Barry Drennan/
Examiner, Art Unit 4133

/ABUL AZAD/
Supervisory Patent Examiner, Art Unit 4133